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Subject: Root Disease, stocking and tree mortality in the Green Springs Area,
Devils Garden RD (NE97-12)

To: District Ranger, Devils Garden Ranger District

Anne Mileck (District Silviculturist) requested that Forest Pest Management (FPM) determine the cause of the mortality in two stands in the Green Springs area of Devils Garden RD. Anne wanted to know how to prevent similar mortality in the future.

On August 26, Anne, Samona Hoelscher (foreign exchange student), John Kliejunas (RO-FPM pathologist), Bruce Roettgering (retired USFS consulting entomologist) and I evaluated the two stands. The stands are in a goshawk management area where it is desirable to maintain high canopy closure. Many ponderosa pine in both stands were recently killed.

Bark beetles killed most of the trees. Root disease killed some trees and probably contributed to weakening some of the trees killed by bark beetles. The high stocking in these stands (about 200

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square feet per acre of basal area) no doubt contributed to the mortality. The stocking of live trees remaining in these stands is approximately 80 sq.ft./ac.

In the first stand, bark beetle infestation and black stain root disease caused by Leptographium wagneri were found. Also, there was evidence of annosus root disease, caused by Heterobasidion annosum. The insects and diseases killed ponderosa pine mostly in the 5" to 14" dbh range and lowered the stocking to about 80 sq.ft./ac., basal area. Most of the understory pine and some of the overstory are affected. Although the presence of the root disease in the stand is not a function of high tree stocking, the effect the diseases have on the trees is. By maintaining stocking around 80 sq.ft./ac. the spread of root disease by root contact would be reduced since fewer roots would be touching. When roots of two pine are in contact, root disease can spread tree-to-tree. In addition, under lower stocking, the pine would be more vigorous and better able to resist the effects of root diseases and bark beetles.

In the second stand, western pine beetle has killed many ponderosa pine mostly in the 6" to 18" dbh range. Some of the larger trees are also killed. Again, stocking levels are being reduced to about 80 sq.ft./ac. Some of the pine had the characteristic black streaking in the outer xylem tissue at the ground line to indicate that black stain root disease is present. Root disease no doubt weakened some of these pine which allowed bark beetles to successfully enter the trees and girdle them.

How can managers prevent similar pine mortality in the future? The answer is by maintaining fewer large trees on each acre. Historically, periodic natural wildfire would have kept the pine thinned. Fire exclusion has allowed these stands to become overstocked, resulting in a loss of tree vigor. Mortality from insects and disease is the result. When the stocking exceeds a sustainable level, nature will take over and reduce it, often to a level lower than the site could support. Nature often maintained stands in an "understocked" condition (our standards) with fire and other disturbance agents. By aggressively thinning overstocked pine stands before insect and disease disturbances occur, high mortality events, like those observed in the two stands we visited, can be avoided. Stocking levels down to 80 sq.ft./ac., basal area, are appropriate, depending upon given management constraints.

ALTERNATIVES

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1) No treatment (exclude fire): All trees will grow (and young trees will become established in openings) and crowd each other. Tree vigor will diminish. In time, individual trees will become stressed and insects or root disease will dominate and kill them. During extended periods of low precipitation, all the trees will be stressed to varying degrees. When most of the pine are weak, most of them can be killed when an insect outbreak occurs. In the two stands we visited, 200 sq.ft/ac. stocking was too high to maintain tree vigor. During the recent drought, insects and root disease took over and reduced the stocking to about 80 sq.ft/ac. Eventually as more and more dead fuels accumulate over most of the forest, unplanned fires will start and become large and intense and kill most of the trees over larger acreages.

2) No treatment (reintroduce fire): Currently, ground and ladder fuels are high in many stands in the area; higher than historically present. By appropriately timing and locating the burns, desired stand conditions can be created. These conditions include tree spacing and age, composition of the understory, amount of dwarf mistletoe in the pine, the types and distribution of plants on the forest floor, and the amount and distribution of litter. Fire cannot precisely control stand conditions, but it is the tool nature used to open up and sanitize the forest. A big advantage to using planned fire in the forest is that the number of large catastrophic fires can be greatly reduced and forest cover can be retained over larger portions of the forest.

3) Mechanically thinning, followed with prescribed fire: By mechanically thinning the forest, precise control of tree spacing and composition can be achieved. By maintaining pine basal area around 80 sq.ft/ac, mortality from root disease and insects will be minimized. Prescribed fire can be applied after mechanical treatment to reduce fuels and future catastrophic fire.

In order to prevent high tree mortality, it is necessary to reduce tree stocking to a level where the trees are not under moisture stress. In the Green Springs area, that level is around 80 sq.ft/ac. If you have further questions, please DG me at B.Woodruff:R05F06A.

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Plant Pathologist

NE California FPM Service Center

cc: Ann Mileck, Devils Garden RD